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### SLIDES: Impacts of Energy Deficits in Cooking, Illumination, Water, Sanitation, and Motive Power

Paul S. Chinowsky

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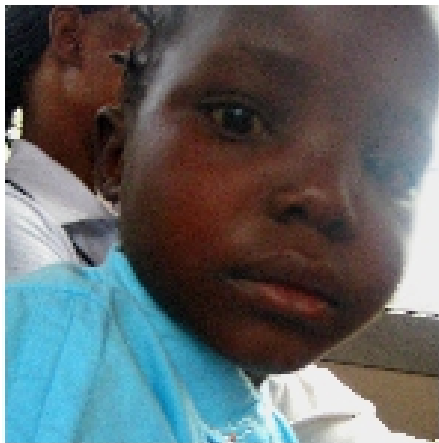
# Impacts of Energy Deficits in Cooking, Illumination, Water, Sanitation, and Motive Power

Paul S. Chinowsky

Mortenson Center for Engineering in Developing Communities

Institute for Climate and Civil Systems (iClics)

University of Colorado



# The Impact of Energy Deficits

- Individual Perspective
- Community Perspective
- National Perspective
- International Perspective

# Individual Perspective

- Energy Affects Everything
  - No Refrigeration - Vaccines
  - No Illumination – Productivity and Education
  - Lack of Telecommunications
  - Lack of Pumping Infrastructure
  - Need for Natural Resources for EVERYTHING

# Individual Impact

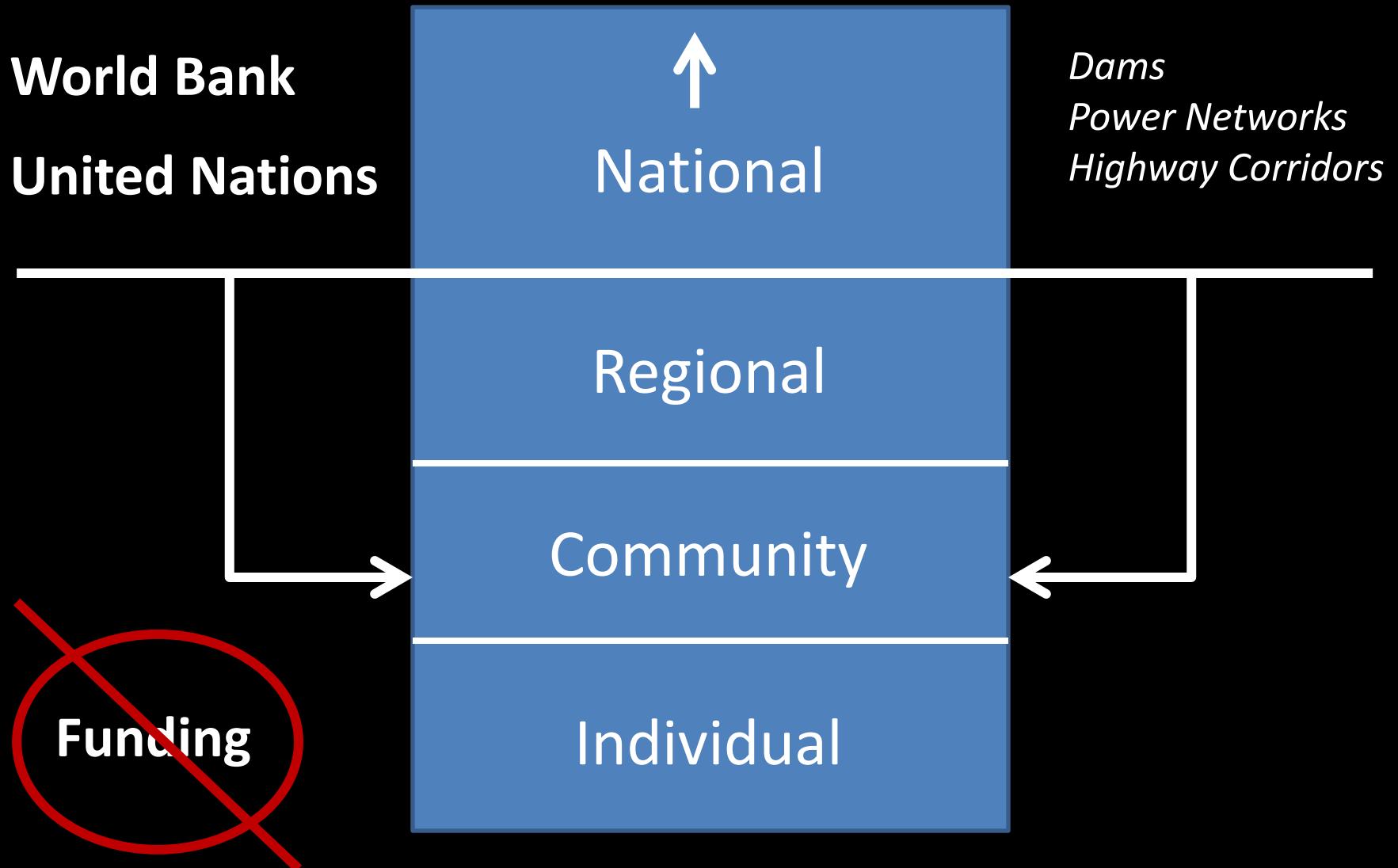
- Children exposed to open-fire cooking in developing countries experience difficulty with memory, problem-solving and social skills.
- 75 percent of Sub-Saharan Africans, or 550 million people, do not have access to electricity. In South Asia, some 50 percent, or 700 million people, lack access.
- Energy investment is also falling in industrialized countries

# The Development Dilemma

- Who are we trying to help?
- What are we trying to achieve?
- What are we trying to influence?
- What is the broader legacy?



# The Vertical Placement



# Infrastructure Planning

Planning requires long-term Outlooks

- Roads – 20-30 years
- Buildings – 30 – 50 years
- Dams – 100 years



**Shelter**

**Governance**

**Food Security**

**Education**

**Community  
Focus**

**Natural  
Resources**

**Economy**

**Infrastructure**

**Health**

Shelter

Food Security

Governance

Education

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Focus**

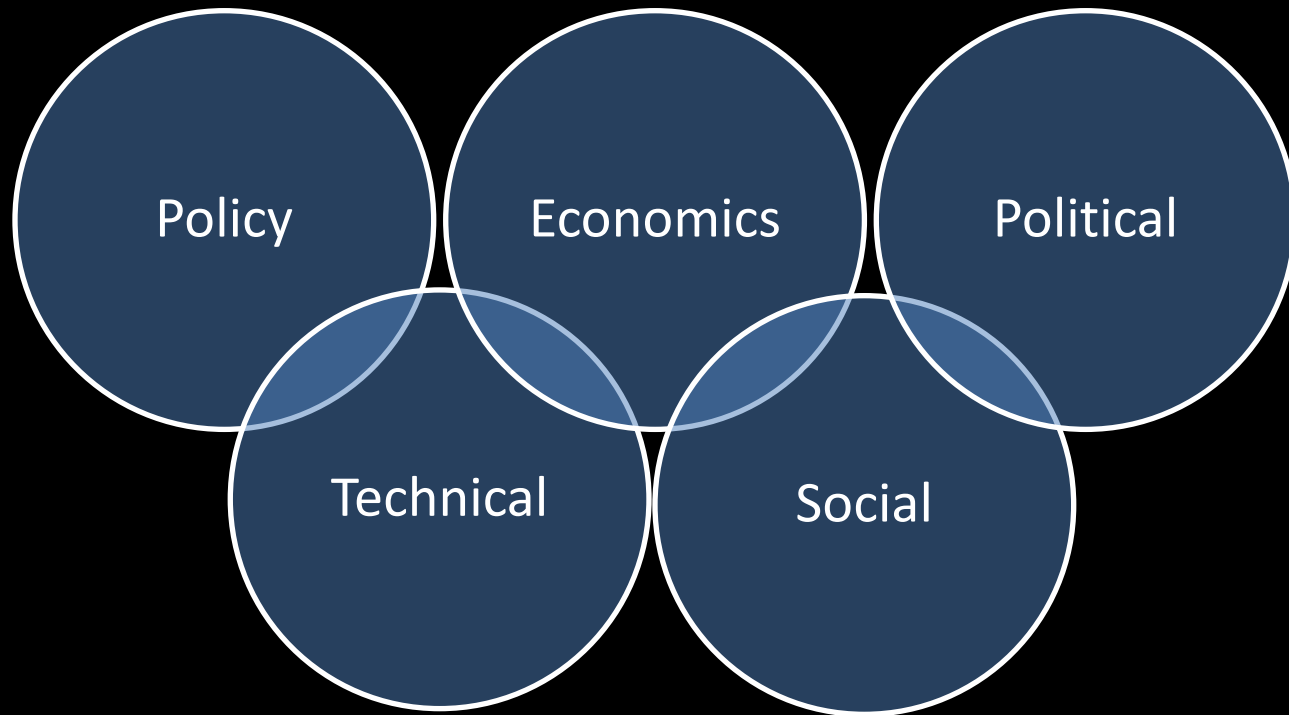
Natural  
Resources

Economy


Infrastructure

Health

# The Interconnected Picture



# The Development Dilemma

- Who are we trying to help?
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- 

A Lack of Infrastructure Resources

**WHAT HAPPENS WHEN WE FORGET**

# Background: Africa

**Table 1.3** International Perspective on Africa's Infrastructure Deficit

Normalized units	African low-income countries	Other low-income countries	African middle-income countries	Other middle-income countries
Paved-road density	34	134	284	461
Total road density	150	29	381	106
Main-line density	9	38	142	252
Mobile density	48	55	277	557
Internet density	2	29	8.2	235
Generation capacity	39	326	293	648
Electricity coverage	14	41	37	88
Improved water	61	72	82	91
Improved sanitation	34	53	53	82

Source: Yepes, Pierce, and Foster 2008.

Note: Road density is measured in kilometers per 100 square kilometers of arable land; telephone density in lines per thousand population; generation capacity in megawatts per million population; electricity, water, and sanitation coverage in percentage of population.

# Some Statistics on Current Infrastructure

- **Electricity**

- All of Africa (800 million ppl) has similar power generation to Spain (45 million ppl)
  - Equal to 3 hours of 1 100-watt lightbulb per person per day

- **Phones**

- 1999-2006: 100 million new subscribers to mobile phones
- In many countries: more access to phones than piped water!

- **Roads**

- 1/3 of rural Africans don't have 2 km access to all-season roads (MDG goal)
- Asset value of many road networks exceed 30% of country's GDPs
  - Presents a HUGE maintenance issue

- **Farmland**

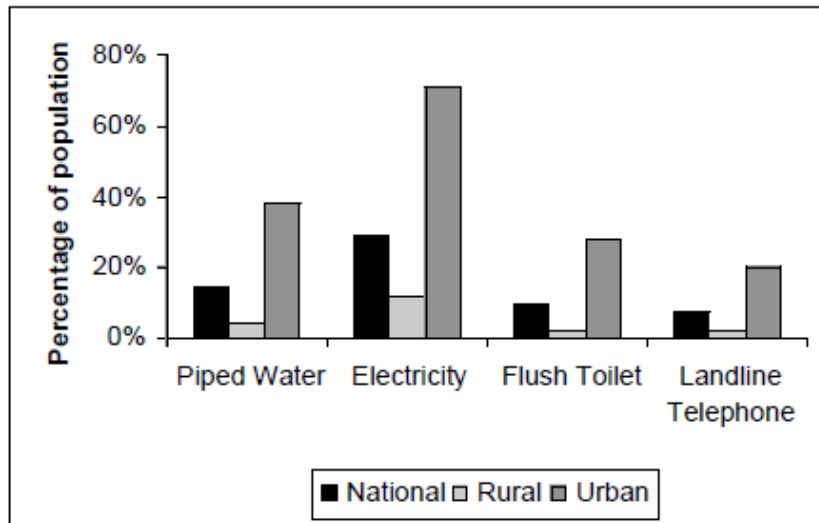
- Less than 5% of farmland is irrigated (accounts for >20% of farm revenue)

# Access to Basic Services

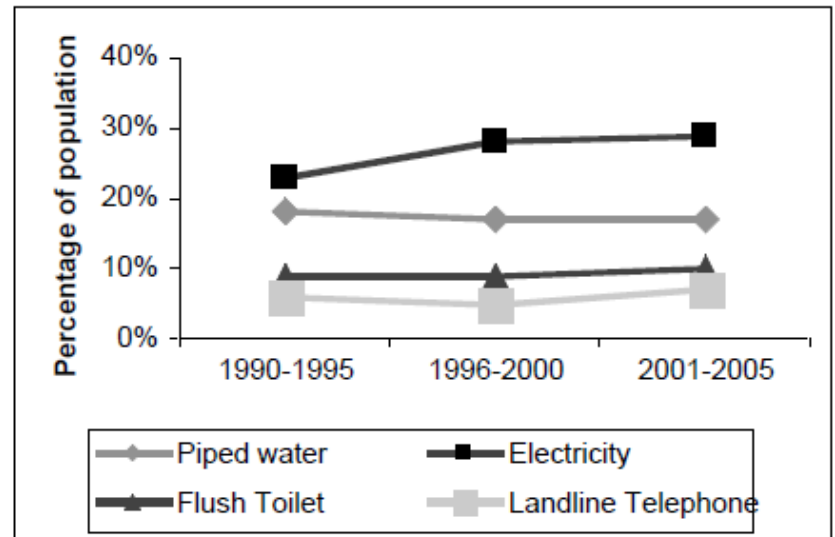
- If current trends continue, it will take 50 years for universal access to services in Africa
  - Due to population growth, urban coverage has decreased in recent years

Figure 1 Access to household services

(a) Rural-urban divide



(b) Stagnant trends



Source: Banerjee and others, 2008.



# ICT & River Basins

Figure 2 Africa's *regional* infrastructure challenge

(a) ICT: closing the circle



(b) River basins: managing commons



# Roads & Power: Existing and Needed

(c) Roads: connecting the dots



(d) Power: toward regional pools



Source: African Development Bank, 2008.

# Estimated Needs

- Estimated \$75 million USD/annum to bridge the gap in Africa's infrastructure needs
  - Equal amounts needed for New Expenditure and O&M
  - 50% needed for Power infrastructure investments
  - This adds up to 12% GDP per country average
    - Over 40% GDP for fragile states

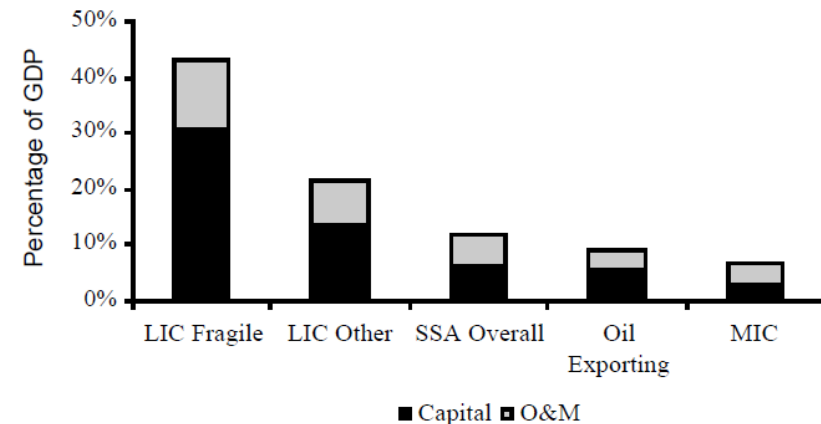
Table 3 Infrastructure spending needs for Sub-Saharan Africa

	US\$ billion per year		
	Capital expenditure	Operations and maintenance	Total spending
ICT	0.8	1.1	1.9
Irrigation	0.7	—	0.7
Power	23.2	19.4	42.6
Transport	10.7	9.6	20.3
WSS	2.7	7.3	10.0
Total	38.1	37.4	75.5

Source: Briceño-Garmendia and others, 2008.

Note: Figures refer to investment (except public sector) and include recurrent spending. Public sector covers general government and nonfinancial enterprises.

Figure 3 The burden of infrastructure needs



# Regionalism

## The Current Gap

- Infrastructure is highly fragmented (legacy of colonialism)
  - Extremely low levels of inter-regional: power, transport, and fiber optic systems
  - 2008: only 16% of power generated is traded (all to/from South Africa)
- BUT: inter-regional development is key: most economies are too small to develop and support major systems
  - 60% of hydro-electric power potential in SSA is in Ethiopia and the Democratic Republic of Congo

## To Close the Gap

- USD\$500 million/annum invested in 28 GW of interconnectors to make Africa regional power pools connect and reduce cost from \$0.30 kw/h to \$0.10 kw/h
- Est. return of up to 160%

# Impact

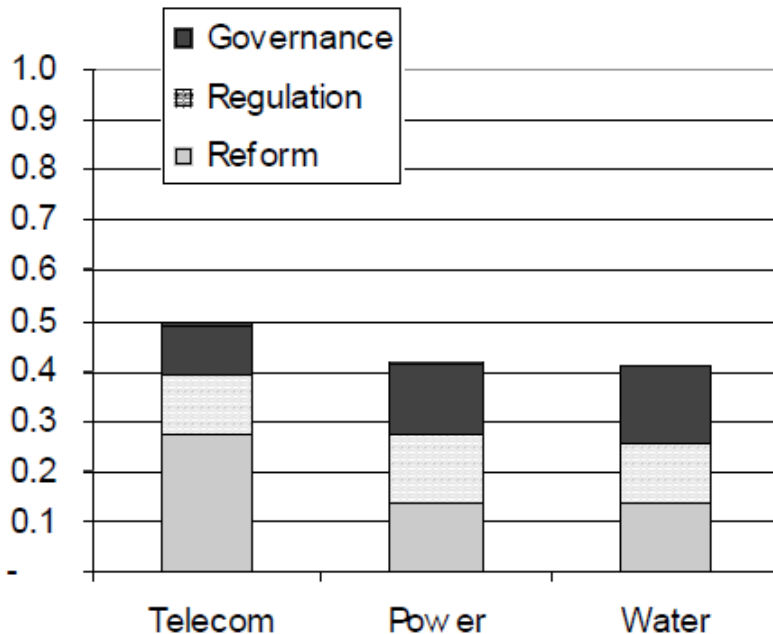
- Lack of infrastructure is a major constraint to doing business
  - Reduces firm productivity by 40%
  - Equal to: Corruption, Crime, Red Tape and limited Finance Markets
  - “Power” is the #1 most limiting factor
    - Electricity, internet, etc.

# How to Address Necessary Changes?

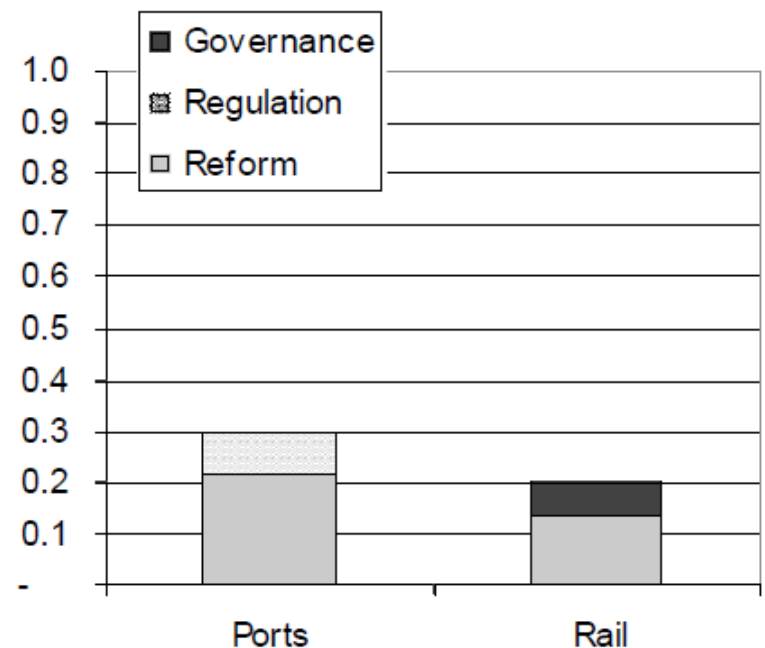
- More Funding?
- Better Governance?
- Private or Public?

Figure 10 Status of institutional reform across infrastructure sectors

(a) Utilities



(b) Transport

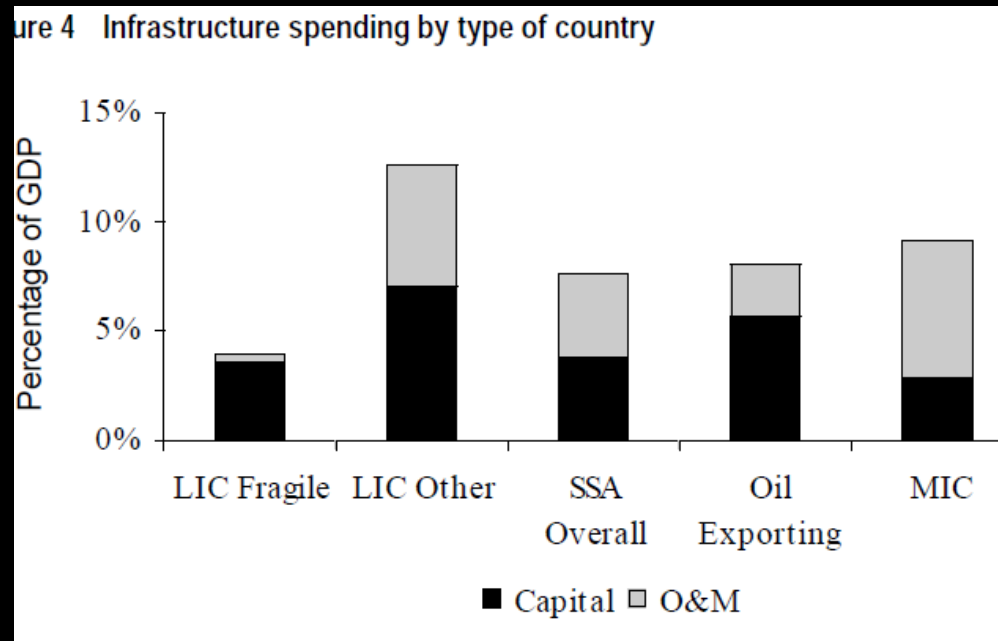


# Current Spending

- Current expenditure on infrastructure could increase by 50% with *no added funding increase*

By:

- Addressing institutional bottlenecks;
- Better planning;
- Earlier completion of feasibility studies,
- Efficient procurement processes;
- Move to multi-year (medium term) budgeting



**Shelter**

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*There is No  
Single Solution  
to Ending Poverty*

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